

Absolute Value Equations

- **Concept:** Solving equations involving absolute value

Remember: The absolute value of a number is the distance between that number and 0 on the number line with no regard for direction. The absolute value of a number can never be negative.

Step 1 Remove the absolute value symbol and write one equation equal to the number and the other equation equal to the opposite of the number. Connect the equations by the disjunction *or*.

Step 2 Solve each equation.

Step 3 Check the results by substituting each value for the variable in the original equation.

Example: Solve and check: $|3 + x| = 15$

Step 1 $3 + x = 15$ or $3 + x = -15$

The number is 15. Set one equation equal to 15 and the other equal to -15. Connect the equations by the word *or*, forming a disjunction.

Step 2 $x = 12$ $x = -18$ Solve the equations.

Step 3 Check by substituting 12 and -18 into the original equation.

$$\begin{aligned} |3 + 12| &\stackrel{?}{=} 15 \\ 15 &= 15 \checkmark \end{aligned}$$

$$\begin{aligned} |3 + (-18)| &= 15 \\ 15 &= 15 \checkmark \end{aligned}$$

Solve and check.

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|-------------------------------|---|
| 1. $18 = 2x $ _____ | 2. $ 4 - x = 17$ _____ |
| 3. $ 10x - 5 = 15$ _____ | 4. $ x = 4$ _____ |
| 5. $ x + 8 = 2$ _____ | 6. $ x - 5 = 6$ _____ |
| 7. $ 3x = 12$ _____ | 8. $ 8 + 4x = 32$ _____ |
| 9. $ 2x - 9 = 9$ _____ | 10. $ y - 1 = 12$ _____ |
| 11. $ 30 + a = 24$ _____ | 12. $ 10x - 5 = 10$ _____ |
| 13. $ x + 5.5 = 0.5$ _____ | 14. $ x + \frac{1}{2} = \frac{1}{4}$ _____ |
| 15. $ \frac{x}{3} = 4$ _____ | 16. $4 (x - 3) = 8$ _____ |
| 17. $3 x - 2 = 9$ _____ | 18. $ \frac{x - 2}{3} = 2$ _____ |